station.

~~64~~ 16 ~~63~~ 15

~~60~~. (New) A method according to claim ~~59~~, wherein the diversity combined signal is an RF analog inbound combined signal representing all of the inbound telephone transmissions in the set of channels, and wherein the step of transmitting a representation of the diversity combined signal to the centrally located base station comprises the steps of:

B1 cont.

digitizing the diversity analog inbound combined signal as a single entity into a single stream of inbound diversity digital samples;

transmitting the single stream of inbound diversity digital samples to the centrally located base station.

REMARKS

New claims 45-60 replace claims 39-44 in order to sharpen the definition of the present invention. These new claims render moot the rejections under the second paragraph of 35 USC 112, and clearly distinguish in a patentable manner over any proper combination of the cited references. The claims do not introduce any new matter prohibited by 35 USC 132.

The Lappington patent shows the broad concept of digitizing telephone signals within a cellular system. From that early point, however, Lappington diverges from the present invention. Lappington receives multiple telephony signals and digitizes them individually in separate converters for each *baseband* signal. He then multiplexes the already digitized individual signals in a complex digital circuit for transport to the remote units.

Applicants' system, on the other hand, modulates the individual baseband telephone signals onto separate analog RF carriers (*e.g.*, at about a 12.5 MHz frequency), then combines the modulated *analog* signals into an RF *analog* signal representing all the telephone channels together. Only at this stage is the signal digitized, and it is digitized once at RF rather than many times at baseband.

At the remote units, Lappington's system similarly diverges from the present invention.

Applicants first step is to convert the digitized sample stream back to an analog form — again, within the RF band, rather than at the baseband of the telephone signals. Lappington, however, first separates the individual channels while they are in digital form. Lappington must then convert each channel individually to an analog form, generate the individual channel carriers at the remote unit, and modulate them for broadcast to mobile units in the cell. Applicants achieve the same final result without going through these expensive steps. Because Applicants' analog signal at the remote unit *already* represents all of the channels each modulated on its own separate carrier, the entire channel set can be broadcast merely be upconverting this single signal in an inexpensive analog RF mixer.

Lappington's method seems to be the simpler method of constructing a digital cellular system. It digitizes early and often, and maintains the digital format as long as possible through the remote cell units. Textbook practice lauds this approach: minimize the analog, accentuate the digital. However, contrary to the prevailing opinion, Applicants delay digitizing the signal until shortly before transmission, and convert it back to analog format early in the receivers' signal paths. Applicants have found that going against the accepted wisdom of the art, using "old" analog technology at certain points in the system, gains a number of advantages, in addition to those already presented. Lappington requires forty separate digitizers at the base station, one for each telephony channel. Applicants employ only a single digitizer operating at a higher frequency. Lappington requires precise framing and synchronization of the digital signals at the base station, whereas the present invention needs only an inexpensive analog RF mixer. Upgrading a conventional analog plant to Lappington's system requires replacement of practically every component; Applicants' digitization is an easy add-on to an existing system, both at the base station and at the remote units.

The Examiner has observed that analog and digital cellular telephones in the same system would lead to digital/analog conversion in order to allow both to be used. In the first place, this type of conversion could occur in addition to the conversions specified in the claims, and not in place of them. Second, the observation is pure speculation; the mere existence of analog/digital conversion manifestly does not render obvious all uses of such conversion. In any case, no references have been adduced for this position.

Again, Lappington follows the conventional wisdom of digitizing early and converting to analog at the latest possible point. Applicants' guiding philosophy is to do much of the signal

processing in analog form, where it is easy and inexpensive, and to employ the digital format where its advantages are strongest — in the long-distance transmission of signals without degradation. The new claims amply demonstrate this complete difference in approach between Lappington and the Applicants.

Claim 45, for example, recites steps of "generating", "modulating", and "combining" analog signals at the base station *before* the step of "digitizing" the analog signal. Lappington digitizes immediately upon receiving the telephone signals at the base station, before any other signal-processing step. Similarly, claim 45 recites the step of "converting" back to analog form at the remote unit upon receiving the outbound digital stream, and can thereupon "broadcast" the signal to the mobile units, without having to go through Lappington's steps of processing the digital representations so as to separate the channels. In the other direction, claim 45 digitizes the analog inbound "combined signal", rather than separating the channels and digitizing them separately as Lappington does. Then, at the base station, claim 45 directly converts the inbound digital samples into a "single RF" analog signal representing "all" of the inbvound channels, and *thereafter* recovers the individual channel signals, when they are in an analog format. Lappington, of course, separates the inbound channels digitally at the base station, *before* converting to analog form.

Dependent claims 46-53 recite particular means of transporting the digitized samples between the base station and the remote unit. Claims 48-53 are especially noteworthy in that the digitized samples, representing telephone channels from the public switched network, are *reintroduced* into that network for transport to and/or from the remote cells; this advantageous transmission method would seem absolutely counterintuitive.

Independent claims 54 and 58 recite limitations of the same form as those of claim 45. Dependent claims 55-57 recite the framing of the digital samples, and the introduction of other signals — not shown by Lappington — into the digital frames. Dependent claims 59-60 recite the diversity signal paths. These use the same sequence of analog and digital signals as the primary paths, and hence have no counterpart whatsoever in the Lappington reference.

The Bouix reference is irrelevant to the new claims, and need be discussed no further.

CONCLUSION

It is respectfully submitted that, in view of the above amendments and remarks, all of the pending claims in the present application overcome the Examiner's rejections and are in condition for allowance. Consideration thereof and allowance is solicited. If the Examiner has any questions or comments which would facilitate passage of this case to allowance, the Examiner is respectfully requested to telephone Applicant's Attorney, J. Michael Anglin, at (612) 373-6971 to discuss such questions or concerns.

Respectfully submitted,

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I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to Assistant Commissioner of Patents, Washington, D.C. 20231 on July 17, 1996.

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